DOCUMENT RESUME

ED 176 206 CS 004 913

AUTHOR Caldwell, Robert M.
TITLE The Effects of Selected Strategies for Teaching Reading to Non-Literate Adult Learners Using Computer Based Education.
PUB DATE Apr 79
NOTE 19p.; Paper presented at the Annual Meeting of the American Educational Research Association (San Francisco, California, April 8-12, 1979)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Adult Basic Education; Adult Literacy; Basic Skills; *Computer Assisted Instruction; Computer Oriented Programs; Educational Technology; *Program Development; Program Effectiveness; *Program Evaluation; Reading Achievement; Reading Improvement; *Reading Instruction; *Reading Programs; Verbal Learning

ABSTRACT

Evaluation studies conducted in 1978 at three sites yielded encouraging results regarding the ability of the Basic Skills Learning System (BSLS) to achieve the goals of adult basic education and demonstrated that effective curriculum models utilizing well-designed instructional paradigms can offer high quality instruction in the basic skills when delivered through computer-based delivery systems. The instructional rationale for establishing and developing teaching strategies for the reading component of BSLS comes from recognizing four conditions that enhance verbal learning: meaningfulness, reinforcement, instructions to learn, and practice. These conditions are met in BSIS by organizing the materials into configurations of strands, clusters, drill and practice, review help sequences, off-line activities, and mastery tests. The field tests monitored adult learners' progress through lessons sequentially arranged in five strands (structural analysis, vocabulary development, literal comprehension, interpretive comprehension, and evaluative comprehension). The data revealed that the average learning time necessary to generate a gain of one full grade level is 18.34 hours of computer-based reading instruction, equivalent to approximately 120 hours of regular school time. (RL)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED176206

The Effects of Selected Strategies for Teaching Reading to Non-Literate Adult Learners Using Computer Based Education

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

Robert M. Caldwell, Ph. D.

Division of Educational Studies

Southern Methodist University

Dallas, Texas

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Robert M. Caldwell

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Presented at the Annual Meeting of the

American Educational Research Association

San Francisco, California

April, 1979

Session # 25.13

CS004913

THE EFFECTS OF SELECTED STRATEGIES FOR TEACHING READING TO NON-LITERATE ADULT LEARNERS USING COMPUTER BASED EDUCATION

Programs of Adult Basic Education tend to structure specific learning outcomes around educational goals which aim to widen the employment opportunities of individuals who take part. Learning experiences are planned so that learners will (Wilson, 1978):

1. Develop a degree of self-confidence that will enable them to respond positively to employment opportunities and to adapt to the demands of jobs or training which they might obtain.

2. Develop a command of necessary life skills with particular emphasis on literacy and numeracy.

3. Discover the type of work they might be interested in and identify and begin to develop those skills associated with this work.

4. Improve their ability to learn and adapt to changing situations.

The Basic Skills Learning System described by Caldwell and Rizza (1978), like many other programs, includes these goals within its planned curriculum but is unique in that it seeks to develop these goals through a modularized network of computer assisted lessons, drills, tests, printed materials

and videotaped presentations. As a total package, these strategies are directed at helping adults whose skills are above the third grade but below the eighth improve their competency in reading, math and language arts. Because of its modularized nature, the instructional system is capable of responding to wide differences in age levels, achievement and interest by using individualized instructional techniques which locate and apply instructional methods which will enhance learning motivation, reinforce student achievement and develop an improved model of management for student learning.

Evaluation studies conducted at three (3) sites between January and June of 1978 have yielded encouraging results regarding the ability of the Basic Skills Learning System to achieve the goals of adult basic education cited above. Rizza and Hunter (1978) report dramatic gains in reading and math achievement as well as improved learner motivation, attitude and self-concept development.

These results are encouraging because they demonstrate that effective curriculum models which utilize well designed instructional paradigms can offer high quality instruction in the basic skills when delivered through computer based delivery systems. Other studies have also demonstrated the effectiveness of computers for teaching the basic skills but unfortunately

few of them have discussed the nature of the instructional models which are used in the curricula. Instead, these reports imply that the results which are obtained are largely due to the uniqueness of the computer system through which instruction is delivered rather than by the effective utilization of the teaching strategies within the computer courseware. The purpose of this paper, therefore, is to explain the instructional rationale which is utilized in the design of the Basic Skills Learning System and to define some of the teaching strategies which seem to be responsible for the dramatic gains achieved at test sites across the country.

Field tests of the Basic Skills Learning System at sites in Minnesota and Maryland, for example, have demonstrated significant gains in reading achievement among adult learners. These learners upon entering the system are diagnosed using criterion referenced inventory tests which establish an achievement profile for each student. Progress is then monitored through lessons arranged hierarchically in five (5) strands. Each strand (structural analysis, vocabulary development, literal comprehension, interpretive comprehension, and evaluative comprehension) contains lessons ordered in difficulty levels ranging from the third through eighth grade. Instruction is based upon the progressive mastery of reading subskills

which emphasize the successful accomplishment of the instructional objectives particular to each lesson before the learner may proceed to more difficult content. Table 1 and Table 2 summarize the results of using such a system with a variety of adult learners (Caldwell and Rizza, 1979):

Table 1

Site: Adult Learning Center, Baltimore, Maryland: February - June 1978

Number of Students	Average Time on PLATO/Student	Average Grade Level Gain	Expected School Time for Similar Growth
24	15 hrs	0.8 grades	120 hrs

Two projects in Minnesota compared the computer based Basic Skills Learning System (BSLS) with traditional educational programs used at each site. Each site utilized approximately twenty (20) students and utilized data collected between February through June of 1978.

Table 2

Site:	BSLS	Traditional
Stillwater Prison Stillwater, Minnesota	15 hrs.*1.62 grade gain	0.0 grade gain
Fair Break (Adult Basic Education Center) St Paul, Minnesota	11 hrs.*1.80 grade gain	0.0 grade gain

*Statistically significant gain

In summary, adult learners using the Basic Skill Learning System to improve reading skills averaged a 1.12 grade level gain in reading achievement after an average instructional time of 13.0 hours. Further analysis of the data reveals that an average learning time required to generate a 1.0 grade level gain would require 18.34 hours of computer based reading instruction. A more detailed analysis of these data is offered by Rizza and Hunter, 1978.

These preliminary results are encouraging if not outright dramatic. The motivational acceptance of the learning system is a result of extensive use of an interactive computer based configuration integrated with a multi-media support package. This multi-sensory approach is often successful with students who have difficulty achieving in text-oriented, passive learning environments and carries with it a compelling novelty effect which most learners find extremely motivating. This effect has been sustained quite often across long periods of instruction.

The presentation of reading instruction through the CBE learning system offers a number of advantages to illiterate adults which compensate for many earlier learning problems. The curriculum is individualized so that it adjusts learner progress in reading subskills by teaching to points of weakness and provides for more opportunities for interaction and feedback than would be expected in a traditional classroom. Teaching

for mastery insures large measures of success and builds student confidence and feelings of self-worth as they make progress through individual clusters. A multi-sensory learning environment provides a rich experience in which to learn new concepts and ideas. Finally, the modularized organization allows for flexible adaptation to a wide variety of learning needs and situations (Caldwell and Rizza, 1977).

The instructional rationale for establishing and developing teaching strategies for the reading component of the Basic Skills Learning System is derived from a recognition of certain conditions which seem to enhance verbal learning (Dececco, 1968). These conditions include meaningfulness, reinforcement, instructions to learn and practice.

Meaningfulness. Noble (1952) defines meaningfulness as the number of different associations elicited by a verbal unit. A learner's ability to make associations will strongly influence his/her rapidity of learning. The more frequently a word or phrase appears in a child's environment the greater the familiarity with it and the greater the probability that meaning will be associated with other words.

The sophisticated capabilities of the modern computer system allow language instruction to take into account each and every student response. Materials are designed to adapt

the amount and extent of instruction to the individual needs of each student. Common techinques such as self-pacing and individualized branching usually employed in programs of individualized instruction are augmented by the ability of the learning system to handle student controlled selection of instructional techniques while providing for a tailoring of teaching to individual performance. In this way, learners are helped to select the pathway through the material which is most appropriate for their needs and are given both regular and distributed practice in language skills. Instruction presented through such a learning system provides the learner with a rich and varied language experience and provides immediate and frequent feedback to responses.

In the Basic Skills Learning System this important condition of verbal learning has been incorporated in several different ways:

1. Great care has been taken to match reading content to student achievement levels. Syntactic structures and vocabulary levels in reading selections are appropriately designed for the learner's grade placement. For example, reading content presented on the display panel (CRT) never exceeds 25 words at the fourth grade level, 50 words at the sixth or 75 words at the eighth grade level. Similarly vocabulary increases

in difficulty and syntax becomes more complex. As students progress through the curriculum, therefore, they are continually challenged with more complex material which has been carefully correlated with concepts which were mastered earlier in the curriculum sequence.

2. Subskills are sequenced in a hierarchical arrangement so that they are reinforced across strands in the following manner:

a. Comprehension is made a part of each lesson.

b. Vocabulary development is introduced at every opportunity although no more than five (5) new words are introduced in a single lesson.

3. Reading material is presented in very small segments to insure concept mastery.

4. Students are allowed control over the learning sequence whenever possible. They are free to choose from many options within lessons. These include opportunities for reviews, remedial sequences, diagnosis and choice of reading content.

5. Feedback is made more meaningful by making it personalized and specific to student response sequences (e.g., "You did well, Allen, but would you like to review prefixes before going to the next lesson?")

6. Graphic and animation capabilities are used extensively to help create cognitive structures necessary for comprehension of key ideas and concepts.

Reinforcement. This is possibly the most important condition of verbal learning. Reinforcement is a confirmation of the learner's correct use of language within various contexts. Language assumes meaning within the context it is used. This context has been called the "semantic environment" (Postman, 1976). If communication is to occur, it requires not just a recognition of language but an ordered situation in which language assumes meaning. The semantic environment defines the meaning of words and, therefore, the nature of the communication. Reinforcement is critical in helping learners confirm whether their attempts at using language communicates within the semantic environment are effective and it helps the learner derive meaning from other new contexts.

In the Basic Skills Learning System reinforcement patterns have been constructed to shape reading behaviors in a manner that will reduce student frustration levels and increase the probability of the student experiencing success. A typical reinforcement pattern is as follows:

Exercise: Change the following word by adding "ing".
(Student must type the correct response)

Come >_____

A correct response on the first try warrants positive reinforcement such as, "great, super, well done, excellent." These and other reinforcing statements are generated randomly from a list of 20 or 30 possible statements. Incorrect responses follow a pattern of shaping and cueing which hopefully lead the student to the correct answer. For example:

First incorrect response: Come _____(drop the e)

The student is cued by reminding him/her of the rule under examination.

Second incorrect response: Come_____(come + ing)

In this second prompt the computer system animates the e in come and it drops from the equation.

Third incorrect response: Come _____ Coming. If on the third try the student still has not typed the correct response, the correct answer is given and the student moves on to the next problem. This type of reinforcement pattern contributes to meaningfulness in that it:

1. Provides specific information which helps to correct student behavior toward achieving the desired outcome,

2. Reduces the frustration often experienced by learners in CAI programs that simply provide a "no" response to an incorrect answer. This type of reinforcement is unsatisfactory because it provides no specific feedback which will enable the learner to discover correct responses. Instead, learners are forced to guess until the correct answer is found.

Instructions to learn. Associations which contribute to the meaningfulness of verbal stimuli can be achieved more quickly if the learner develops a state of readiness which is induced by directions or verbal organizors within the environment. This verbal "set" helps focus the learner's attention on specific stimuli within an environment which is bombarded with verbal stimuli. The Basic Skills Learning System provides instructions which aid student learning in various ways:

1. In many CAI lessons students very often make mistakes on practice exercises because they do not understand directions on what to do. Exercises which require typed responses seem particularly prone to this problem (Caldwell, 1974). This system has taken great care to provide sample exercises before each practice to reduce this type of mistake. In this way,

responses can be judged on the basis of concept mastery rather than on a lack of understanding of the response mechanism.

2. Each lesson states the performance objectives to be mastered in that lesson in terms which each student can comprehend. Students, then, have a clear idea about the learning behaviors expected of them.

3. Throughout each lesson students are presented with checkpoints and summaries of what they have learned and what they will be learning in future segments of the lesson. This helps develop a structure for the learner which we believe helps organize the concepts presented for study.

4. All directions are written in simple language and illustrated with examples as stated above.

Practice. Research on skill learning has well documented the effects of practice: the longer the learner works at learning the more he/she will learn (Underwood, 1964). Research on verbal learning, however, has not resulted in the same degree of certainty about this effect. Essentially, the value of practice, particularly in verbal learning, depends less upon the amounts than on the nature of the practice. More research is needed

to discover which types of practice (e.g., massed vs. distributed) are appropriate to various types of learners, what are the effects of overlearning, and whether the whole or part method of presentation is most effective at various levels and with various materials. One form of practice in the Basic Skills Learning System which adds significantly to helping learners develop reading skills was the typed response. When students were allowed to type their responses rather than simply choose from alternatives, it seemed to produce the following advantages:

1. Students seemed to express more favorable attitudes toward writing and the use of verbal language.

2. Spelling skills and the ability to generate language improved.

3. Personalized feedback was made possible

The typed response did have its negative features as well. For example, typing very often became time consuming with students making many errors in typing. This had the effect of distracting students from the concept under consideration and focused their attention on the typing task. A related problem was that many errors in typing were judged by the computer to be incorrect responses and routed students into remedial sequences when they in fact knew the concept being studied.

Also, if typed responses are not carefully cued, learners are often forced into an "open loop" i. e. they have little idea about what is expected of them and become frustrated trying to type a correct response which will ultimately advance them to the next frame. This is a common error made by instructional designers and has an extremely negative effect on learners.

The instructional considerations mentioned above are important ingredients in the recipe for success in teaching basic skills. In the Basic Skills Learning System these conventions have been incorporated into a series of tutorial and drill-practice strategies which are set into the following configuration:

STRAND A set of concepts and skills which have been ordered hierarchically according to common and expected outcomes. In reading, these strands are Structural Analysis, Vocabulary Development, Literal Comprehension, Interpretive Comprehension, and Evalutive Comprehension.

CLUSTER Within strands content is further divided into subskills. Related subskills expressed in behavioral terms are grouped in a meaningful way in clusters. Each cluster contains:

TUTORIAL--presentation of new material to the learner on the objectives within a cluster. It is characterized by concept explanation, demonstration, explanation, and/or inquiry, as well as student assessment, branching, and feedback.

DRILL AND PRACTICE--presents a series of drill examples of similar form on each objective in the cluster. It is designed to strengthen the newly acquired skill(s).

REVIEW HELP SEQUENCE--presents a capsulated form of the cluster tutorial for review and refresher purposes.

OFF LINE ACTIVITY--presents an off-line form of the drill and practice materials to allow students to strengthen the newly acquired skills away from the terminal.

MASTERY TEST--presents a series of test items designed to evaluate the student's achievement across competencies addressed by the cluster.

Summarizing, then, the Basic Skills Reading System assesses each learner for placement and diagnostic purposes by a series of inventory assessment instruments which accompany each strand in the system. Progress, retention, and achievement are measured by the mastery and retention tests which accompany each cluster throughout the instructional system.

In short, computer based systems can be designed on a large scale to provide basic skills instruction over a wide range of abilities and grade levels. Further development and use of these systems offer great potential for individualizing instruction in ways not possible before interactive

computer systems became available for wide use. Careful attention to the organization of curriculum materials within these systems and utilization of effective teaching strategies can improve the effectiveness of these systems further and maximize the benefits for potential users presently and in the immediate future.

References

Caldwell, R. M. "Evaluation of a Program of Computer Assisted Reading Instruction for Semi-Literate Adolescents." Paper presented at the American Educational Research Association Annual Meeting. Chicago: March, 1974.

Caldwell, R. M. and Rizza, P. J. "The Potential and Use of Computer Based Education in American Higher Education." Paper presented at the Annual Conference of The Society for Research into Higher Education, The University of Surrey, Guildford, Surrey, England, December, 1977, p. 2.

___. and Rizza, P. J. "The Development and Implementation of a Computer Based System of Reading Instruction for Adult Non-Readers." Paper presented at The American Educational Research Association Annual Meeting. Ontario, Canada: March 28, 1978.

___. and Rizza, Jr., P. J. "Computer Based Reading Instruction: Its Effect on Adults." Paper presented at the annual meeting of the International Reading Association. Atlanta, Georgia: May, 1979.

Noble, C. E. "An Analysis of Meaning." Psychological Review, 59, 421-30.

Postman, N. Crazy Talk, Stupid Talk. New York: Dela Corte Press, 1976.

Rizza, P. J. and Walker-Hunter, P. The Basic Skills Learning System: An Evaluation Report on Field Tests Conducted from January 1, 1978 to July 1, 1978. Summary Report. Minneapolis: Control Data Corporation, 1978.

Underwood, B. J. "Laboratory Studies of Verbal Learning." Theories of Learning and Instruction, ed. B. R. Hilgard. Part I of 63rd Yearbook of National Society for the Study of Education, Chicago: University of Chicago Press, 1964, pp. 133-52.

Wilson, D. "The Needs of Special Groups of Students: Course Design for Unemployed Youth." Course Design and Student Learning, David Billing, (Ed.) Surrey, England: Society for Research in Higher Education. 1978, pp. 32-34.